

Overview



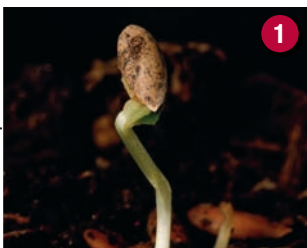
Springtails on a mushroom

Casual observers often overlook and misunderstand the roles of important microscopic organisms in every ecosystem. Although the world of **decomposers** may go unnoticed, decomposers play an essential role in the cycle of life.

This unit focuses on decomposers and their role in breaking down carbon-based **organic** matter, materials that come from living things. Only fungi and **bacteria** are correctly categorized as true decomposers. Many students know

decomposers simply as “nature’s recyclers.” Throughout the unit, students learn that decomposers are actually part of a larger system that works to cycle chemicals such as carbon, nitrogen, water, and oxygen through complete food webs.

At a Glance



Breaking It Down

Read about composting and take part in a composting demonstration using bananas and yeast.



Decomposers and Scavengers

Examine descriptions and photographs of decomposers and scavengers and compare characteristics.



A Big Job for a Tiny Crew

Observe and discuss evidence of decomposition and the role of decomposers in ecosystems.



California Content Standard

- 4.2.** All organisms need energy and matter to live and grow.
- 4.2.c.** Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

Students may already have learned that energy flows from one organism to the next in any ecosystem through food chains and food webs. In this unit, students learn that, in order for food webs to function, decomposers must help cycle nutrients in every ecosystem. Students become familiar with various decomposers, understand their roles within all ecosystems, and connect the contributions of decomposers within **natural systems** to the health and continuation of those systems. Students also identify several human practices that depend on **decomposition** and the work of decomposers; these practices include agriculture and waste management.

Lesson 1 introduces students to the relationship between decomposers and humans through a story about several Californians who use various methods for generating compost from their food scraps

California Environmental Principle III

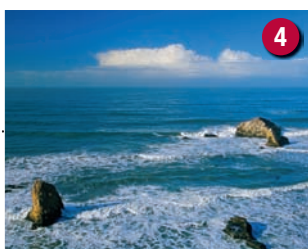
Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Concept A: Students need to know that natural systems proceed through cycles and processes that are required for their functioning.

Concept B: Students need to know that human practices depend upon and benefit from the cycles and processes that operate in natural systems.

and then use the compost in gardens to grow more food. In Lesson 2, students identify examples of decomposers and the special relationship between **scavengers** and true decomposers. Students explore evidence of decomposition and the role decomposers play in releasing nutrients back into terrestrial and marine ecosystems in Lesson 3. Lesson 4 teaches how decomposers are essential to our system of wastewater treatment, while Lesson 5 focuses on how human food production ultimately depends on

decomposers' abilities to replenish nutrients in the **topsoil**, making it more suitable for agriculture. In Lesson 6, students return to the idea of composting as a way of producing nutrient-rich **humus** to support plant growth; they also look at composting as a way to reduce organic waste that might otherwise be destined for our already-overflowing landfills. By the end of the unit, students have an appreciation for and understanding of decomposers and the essential role they play in all natural and **human social systems**.



Waste Not

Interpret a diagram showing a wastewater management system and answer questions.



Down on the Farm

Investigate and describe why decomposers and humus are essential to agriculture.



The Benefits of Composting

Discuss how composting can help communities manage waste.

California Connections

Wonderful Compost

The warm days of summer turn cooler. Tree leaves shake and rustle in the wind. It is October, and crisp red apples ripen on the trees. In the fall, Juliana Kelly loves to pick apples. Her family goes to an apple orchard every year.



The orchard is in the foothills of the Sierra Nevada Mountains. Its name is Apple Hill. Juliana picks sweet, red apples and puts them in her basket. She will

eat the apples in pies, as a snack, and in her school lunch.

At home, Juliana helps her mother make apple pies for the neighbors. She carefully takes the core out of each apple. All of these apple cores have to go somewhere. Juliana has some choices. She can put the apple cores in the trash. A garbage truck will pick up the trash and take it to a landfill. Juliana has another choice. She can save the apple cores for the family compost pile.

Juliana decides not to put the apple cores in the garbage. Instead, she adds them to the compost pile in her backyard. She throws the apple cores on top of the compost pile with other vegetable, fruit, and food scraps. Then she adds some grass from the lawn-mower bag. She sprinkles some rich, black soil on top.

The apple cores and the cut grass soon begin to rot. Scientists use the word “decompose” to explain what happens to the food scraps. Tiny organisms live in the pile. Bacteria and fungi change the chemistry of the



Apple tree

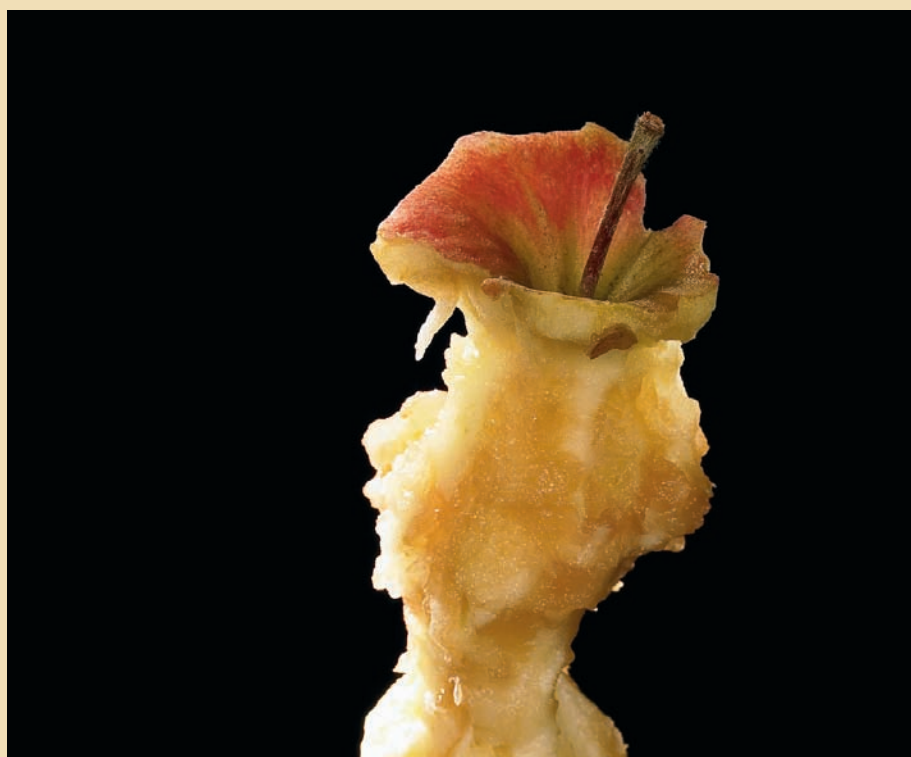


tomatoes grow. Her family will begin to eat them when summer comes. Juliana will remember her compost each time she bites into a juicy tomato.

Juliana's mother takes a fresh apple to work. After she eats her snack, she puts the apple core in a covered box. In the box are hundreds of wriggling red worms. Tiny decomposers also live in Mrs. Kelly's box.

The red worms begin to eat the apple core. Their intestines are rich with juices. These juices break down the food. The worms leave behind droppings. The name for their droppings is "castings." Tiny decomposers will break down the castings and release vitamins and minerals. These nutrients are good for plants. Mrs. Kelly will use the castings to help her garden grow.

When a worm dies in the worm box, tiny bacteria go to work. They break down the carbon, nitrogen, and protein in the worm's body. Bacteria need carbon and nitrogen for energy. They need protein to grow and



Apple core

food, and break it down into nutrients that enrich the soil. Chemical decomposers are tiny. People need a microscope to see them.

Mites, pill bugs, snails, and springtails live in Juliana's yard. So do beetles, ants, flies, and earthworms. They all find their way to the compost pile. These physical decomposers or scavengers grind, bite, chew, and tear the food into tiny pieces. They work with bacteria and fungi. Together they turn the food scraps into compost.

Juliana knows that the decomposers need help. They must have water, air, and lots of food to make healthy compost. Juliana sprays her compost pile with water every few days. She uses a shovel to turn the compost pile. Turning the pile gives the decomposers a fresh supply of air. She also makes sure they have lots of fresh food scraps.

The compost is ready to use in a few months. It smells and looks like rich, healthy soil. Juliana puts

the new compost in her garden. She mixes it with the soil. Then she plants pumpkin seeds and tomato seeds. She waters them well. Soon she will see tiny plants begin to sprout. Juliana will watch her pumpkins and



Apples in compost pile

multiply. Decomposers like bacteria leave their own waste behind. This waste is rich in nitrogen, phosphorus, and magnesium.

“Vermicomposting” (“vermi” means worm) is the term for what happens when worms decompose food waste. Vermicomposting is a good choice for people who want to compost but do not have a big backyard. A box of special red worms takes little space. People can buy the worms online or at a local nursery. The worms need bedding like shredded newspaper. They need a steady supply of food scraps. They need someone to make sure their home doesn’t get too wet or too dry. Many classrooms have worm bins. Sometimes students put the castings in their school gardens. Other students take the castings home for their houseplants.

Lucas Garcia is a young boy who lives in Alameda, a town near San Francisco. He does not have a garden. But he knows how to use his family’s food scraps for compost. Lucas reminds his family to put their food waste in a special bucket by the sink. When it is full, he dumps it into a green waste cart outside the house. Mrs. Garcia puts grass into the green waste cart after she mows the lawn.

Each week Lucas pushes the green cart to the street. A special green truck picks up the Garcias’ green waste. The truck stops at every house in Alameda. The green waste goes to one big composting place. There, decomposers and scavengers turn the waste into compost. Other cities send their green waste to the same place. California has so much green waste that it creates 4 million tons of compost each year.

Farms, vineyards, and orchards use the compost that Lucas helps the city make. Farmers in the Central Valley, Napa Valley, and Sonoma Valley add compost to their soil. They

add compost to orange, avocado, and almond trees. Compost also helps grapes, tomatoes, and other crops. Farmers who use compost can water less. They can also cut back on use of chemical fertilizers, which can sometimes pollute the environment and make animals sick. Compost makes the soil and plants healthier. Using compost is good for farmers. It is also good for our land, food, and water.

Making compost means putting less in the garbage can. Less trash means fewer garbage trucks. This means less traffic and pollution. Less traffic and pollution can mean better air to breathe. Landfills will fill more slowly if people make less trash. Many landfills are built on open space that provides habitat

for wild animals. When new landfills are built, habitat for animals is often destroyed. Finding new places to take our garbage is very difficult. Every person in California makes about 58 pounds of trash each month. You probably already recycle bottles, cans, and paper. How much less trash would you make if you made compost?

Juliana and Lucas feel good about composting their food waste. They use what some would call garbage to make soil healthier. They know that making compost with the help of decomposers is an important step. Their families and their friends can enjoy healthy food and safe water. Food grown in composted soil can improve the quality of life for all.



Red worms feeding

